
Microengineering

Fields of education: Engineering and Information Technologies

1. Professional qualification

Professional career outline

Microengineering is clearly a key discipline for the Swiss industry. As an example, in Western Switzerland, the work force in the field of microengineering and watch industry reaches about 60'000 jobs in Autumn 2019. Microengineering, i.e. all the technologies required to design, manipulate and manufacture miniaturized systems, is at the intersection between several fields like micromechanical engineering, electronics, information technologies, optics and material science. The discipline requires therefore a wide range of knowledge and competencies. Thanks to the MSE in Microengineering, the Master student will strengthen your multidisciplinary abilities, your soft skills, as well as your knowledge in product industrialization. You will be ready to take up the challenge of the transition to the digital factory, and carry out an Applied Research and Development project of high complexity and high density of technological integration.

Professional skills

The graduate of a Master's degree in Microengineering is able to develop and design miniature parts or devices for different industrial sectors such as watchmaking, medical technologies, production equipment and instrumentation. In particular, he is able to develop miniaturized product with high added value, and gives priority to integration, reliability, ergonomics, quality and environmental impacts.

In addition, he has in-depth knowledge of micro-manufacturing and machining processes (conventional machining, laser manufacturing, Electro Discharge Machining, micro- and nanotechnologies). He is able to identify the most appropriate micromanufacturing process for a specific application and considers it from the design phase.

His basic knowledge in fields as diverse as mechanical engineering, information and communication technologies, electronics, physics, optics and materials science allows him to have a complete and detailed overview of an interdisciplinary project. He is a key person within a research or development team, able to talk with specialists in the various fields of engineering, analyzing and understanding the mechanical, electronic and computer issues at stake in a project.

His multiple, interdisciplinary and soft skills enable him to imagine, create and develop innovative solutions in the fields of watchmaking, advanced sensors, quality control, biomedical devices, production equipment, robotics and automation. Moreover, his open-mindedness, his innovative and creative spirit make him a key player in facing today's challenges in microengineering fields, such as the transition to

the digital factory, by taking advantage of his specific knowledge and skills in computer vision as well as in automated and robotic systems.

In addition, such interdisciplinarity and ability to take care of complex projects, as well as these soft skills make him the ideal candidate for positions of responsibility, such as project, product or team manager.

Entry skills

Specific skills are required to enrol in this profile. Students holding one of the following Bachelor degrees generally fulfil these entry requirements.

- BSc in Microengineering

The assessment of the entry skills is part of the enrolment process of the respective school. Students who do not hold one of the above mentioned Bachelor degrees will be individually assessed for their suitability by the respective University of Applied Sciences.

Differentiation to bachelor level

As the Bachelor's degree in Microengineering is intended to be professionalizing, students are quickly oriented towards professions in the field of application of the local industry (for example, watchmaking engineering, or medical technologies). The 3-year course does not allow a large multidisciplinary expansion. Therefore, the theoretical modules of the MSE in Microengineering aim to reinforce your multidisciplinary knowledge, your competencies in product industrialization, as well as your soft skills. The remaining 60 ECTS credits will allow you to deepen your more specific skills in the professional orientations of your choice.

2. Profile contents

Through MSE studies in Microengineering, you will acquire in-depth knowledge and skills in the following fields:

- New design methodologies for microengineering products: The MSE graduates must be able to follow all the iterative steps and tools of the design process, including functional analysis with ergonomics and reliability aspects.
- Development of advanced and smart sensors. The current trends in Digital Factories involve the need of advanced sensors. To develop such sensors, the graduates need to understand multidisciplinary technologies: electronics, optics, Internet of Things, basics of machine learning.
- Advanced manufacturing processes specific to miniaturized products: conventional 5-axis micro-machining, laser manufacturing, Electrical Discharge Machining (EDM), electroforming and techniques which are derived from the micro-nanotechnologies (e.g. UV-LIGA process).
- Inspection and quality control: The goal of this topic is to teach the fundamentals of quality inspection, i.e.:
 - How the quality inspection fits within a quality management system
 - Introduce the statistical and mathematical tools that are used in quality control.
 - Give an overview of the measurement or inspection techniques that are commonly used in the field of microengineering.
 - How to assess the capability of the measurement instrument (Gage R&R)